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**Procedural**  
**Requirements**

**COMPLIANCE IS MANDATORY**

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## **Safety and Mission Assurance (SMA) Audits, Reviews, and Assessments**

**Responsible Office: Office of Safety and Mission Assurance**

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# Preface

## P.1 Purpose

This NASA Procedural Requirements (NPR) document establishes requirements for conducting audits, reviews, and assessments to verify compliance with applicable Federal, State, and local safety and health statutes and regulations and NASA Safety and Mission Assurance (SMA) requirements as required by NASA Policy Directive (NPD) 1000.3, The NASA Organization and NPD 8700.1, NASA Policy for Safety and Mission Success in accordance with NPD 1210.2, NASA Surveys, Audits, and Reviews Policy.

## P.2 Applicability

P.2.1 This NPR is applicable to NASA Headquarters and NASA Centers, including Component Facilities and Technical and Service Support Centers.

P.2.2 This NPR applies to any NASA program, project, institution, operation, or facility that is responsible for the application or implementation of SMA requirements.

P.2.3 This NPR applies to the Jet Propulsion Laboratory (JPL), a Federally Funded Research and Development Center (FFRDC), to other contractors, and national or international partners to the extent specified or referenced in applicable contracts, grants, or agreements.

P.2.4 In this NPR "shall" denotes a mandatory requirement, "may" or "can" denotes a discretionary privilege or permission, "should" denotes a good practice, and "will" denotes an expected outcome.

P.2.5 Unless otherwise indicated, definitions of all words and terms used in this NPR are per NASA-STD-8709.22, Safety and Mission Assurance Acronyms, Abbreviations, and Definitions.

## P.3 Authority

a. Basic Program Elements for Federal Employee Occupational Safety and Health Programs and Related Matters, 29 C.F.R. pt. 1960.

b. NPD 1000.3, The NASA Organization.

c. NPD 1210.2, NASA Surveys, Audits, and Reviews Policy.

d. NPD 8700.1, NASA Policy for Safety and Mission Success.

### P.4 APPLICABLE DOCUMENTS

a. NPD 1200.1, NASA Internal Control.

b. NPD 1440.6, NASA Records Management.

c. NASA-STD-8709.22, Safety and Mission Assurance Acronyms, Abbreviations, and Definitions

d. NASA Safety and Mission Assurance Requirements Documents (NPDs, NPRs, and NASA Standards) posted on the SMA Requirements Tree,

<http://www.hq.nasa.gov/office/codeq/doctree/doctree.htm>.

## **P.5 Measurements/Verification**

This NPR is used to determine compliance with applicable Federal, State, and local safety and health statutes and regulations and NASA SMA Directives. Additionally, this NPR establishes requirements for NASA Centers, programs, and projects to develop and implement their own internal SMA audit, review, and assessment processes. Verification of compliance with this NPR and effectiveness of this NPR at the Agency level is performed in conjunction with the NASA Internal Controls Program as defined in NPD 1200.1, NASA Internal Control. Implementation of this NPR is subject to periodic audit and assessment by an independent organization. Verification of compliance with this NPR and effectiveness of this NPR at NASA Centers, programs, and projects is based on the results of the SMA audits, reviews, and assessments performed. This includes adequate, timely, and effective response to action items, findings, and corrective action plans, as well as tracking repeat findings and overall trends identified during SMA audits, reviews, and assessments.

## **P.6 Cancellation**

NPR 8705.6A, Safety and Mission Assurance Audits, Reviews, and Assessments, dated April 9, 2009.

/S/

Bryan O'Connor  
Chief, Safety and Mission Assurance

# Chapter 1. Program Overview

## 1.1 Introduction

1.1.1 Per NPD 8700.1, NASA Policy for Safety and Mission Success, it is NASA policy to verify and validate life-cycle implementation of the SMA processes and any related safety and mission success requirements through ongoing surveillance of program, project, and contractor processes. Also, it is NASA policy to certify the safety and operational readiness of hazardous or mission critical hardware and software (including flight systems, support equipment, facilities/operations, and ground-based systems) through a process of formal review of the compiled validation and verification information.

1.1.2 NPD 1000.3 assigns responsibility to the Chief, Safety and Mission Assurance to ensure the incorporation and fulfillment of SMA requirements established for NASA programs and institutions through the structured application of SMA Technical Authority (SMA TA) and to verify the effectiveness of SMA requirements, activities, and processes.

1.1.3 This NPR outlines procedures for audits, reviews, and assessments to verify compliance with NASA SMA requirements, as required by NPD 8700.1, NASA Policy for Safety and Mission Success and NPD 1000.3, The NASA Organization, and the applicable Federal, State, and local safety and health statutes and regulations.

1.1.4 Per NPD 1210.2, NASA Surveys, Audits, and Reviews Policy, it is NASA policy to establish minimum criteria for the conduct of Headquarters-initiated audits and reviews of NASA activities in such a way that the surveys, audits, and reviews are value-added and effective in support of the Agency's mission.

## 1.2 Objectives

1.2.1 This NPR provides requirements for:

- a. Verifying each NASA Center's, Component Facility's, and JPL's (an FFRDC) implementation of, and compliance with, applicable Federal, State, and local safety and health statutes and regulations and NASA SMA requirements. Note: The term "NASA Center" will refer to the NASA Center, Component Facility, and the Institutional part of JPL (an FFRDC) as a Facility and Real Property, hereafter, in the applicability of this NPR.
- b. Verifying each program/project's, implementation of, and compliance with, applicable Federal, State, and local safety and health statutes and regulations and NASA SMA requirements.
- c. Supporting the Agency's determination of readiness to test, operate, fly, launch, or recover mission and research equipment.

1.2.2 The principal chapters of this NPR provide requirements for the Agency's SMA audit, assessment, and review processes described below. Detailed information, such as detailed processes, sample timelines, sample audit guides, sample Corrective Action Plan (CAP ) templates, and other background information, can be found on the NASA Safety Center Audits and Assessments Web site at <http://nsc.nasa.gov/auditsassessments/>.

- a. Institutional/Facility/Operational (IFO) Safety Audit process. This process provides independent verification that institutions, facilities, and operations at each NASA Center are in compliance with

the applicable IFO safety requirements, including applicable Federal, State, and local safety and health statutes and regulations and NASA SMA requirements.

b. Quality Audit, Assessment, and Review (QAAR) process. This process provides independent verification that each NASA Center, program, and project is in compliance with the applicable NASA SMA quality assurance requirements.

c. Requirement Flow Down and SMA Engineering Design Audits and Assessments (REDAA) process. This process: 1) provides independent verification of the flow down of SMA requirements to the NASA Centers, programs, and projects including requirements flow down to NASA contracts; and 2) provides independent evaluation of the NASA SMA requirements implemented on programs and projects for system safety, reliability and maintainability (R&M), risk analysis, and risk management.

Note: The IFO Safety Audit, the QAAR, and the REDAA are collectively referred to as SMA audits and assessments (see Chapter 2).

d. Safety and Mission Success Review (SMSR) process. The SMSR process prepares Agency safety and engineering management to participate in program or project management pre-operations or major milestone review forums. The SMSR provides the knowledge, visibility, and understanding necessary for senior Agency safety and engineering management to concur or nonconcur with program decisions to proceed.

# Chapter 2. SMA Audits and Assessments

## 2.1 Overview

2.1.1 In addition to the main objective stated in 1.2.1, SMA audits and assessments are conducted to achieve the following other objectives:

- a. Verify that applicable Federal, State, and local safety and health statutes and regulations and NASA SMA requirements are appropriately documented and flowed down.
- b. Verify that documented processes achieve the intent of the NASA SMA requirements.
- c. Provide NASA Center, program, or project management with an independent, objective, and constructive evaluation of the compliance of the institution, facilities, operations, programs, or projects with the applicable requirements.
- d. Identify areas for continual improvement of the implementation of NASA SMA requirements.

2.1.2 The objectives stated in 2.1.1 are accomplished by the following activities, which include but are not limited to:

- a. Reviewing the NASA Center, program, or project organizations' SMA requirements and documented procedures to ensure that applicable Federal, State, and local safety and health statutes and regulations and NASA SMA requirements are appropriately flowed down and implemented.
- b. Reviewing documentation and records of completed work and training.
- c. Assessing the capability of the NASA Center, program, or project organization to implement the applicable Federal, State, and local safety and health statutes and regulations and NASA SMA requirements.
- d. Interviewing NASA Center, program, or project organizations' personnel.
- e. Observing the NASA Center, program, or project organizations' procedures, processes, and practices.
- f. Verifying the effective implementation of corrective actions, including those related to previous audit findings.
- g. Collecting and examining objective evidence that demonstrates compliance with the NASA SMA requirements (see definition in Appendix A).

2.1.3 SMA audit and assessment processes coordinate with and leverage audits, reviews, and assessments conducted by the Center, program, project, other NASA or governmental organizations, or certified nongovernmental organizations to facilitate verification of compliance with SMA requirements.

## 2.2 Roles and Responsibilities

2.2.1 The NASA Associate Administrator and Associate Administrator for the Mission Support Directorate shall ensure that NASA Centers have adequate resources to perform regularly scheduled internal SMA audits and assessments and support SMA audits and assessments (Requirement).

2.2.2 Mission Directorate Associate Administrators shall ensure that programs and projects have adequate resources to perform regularly scheduled internal SMA audits, reviews, and assessments and support SMA audits and assessments (Requirement).

2.2.3 The Chief, Safety and Mission Assurance shall:

- a. Implement the SMA audit and assessment process in accordance with NPD 1210.2 and with the support of the NASA Safety Center (NSC) (Requirement).
- b. Select the SMA audit and assessment requirement set that will be the scope of the SMA audit and assessment with inputs from the Office of Safety and Mission Assurance (OSMA) staff and the NASA Center, program, or project (Requirement).
- c. Request that the NASA Center, program, or project identify an audit and assessment point of contact to facilitate assistance from the NASA Center, program, or project during the SMA audit and assessment (Requirement).
- d. Provide an announcement letter to the NASA Center, program, or project identifying the intent to audit or assess the organization and providing a schedule of activities related to the SMA audit and assessment (Requirement).
- e. Verify implementation of effective corrective actions for all SMA audit noncompliance and track corrective actions to closure (Requirement).
- f. Provide SMA audit and assessment results to affected/applicable NASA Headquarters and NASA Center Organizations (Requirement).

2.2.4 The NSC Director shall: a Manage SMA audits and assessments on behalf of the Agency's Chief, Safety and Mission Assurance (Requirement).

- b. Ensure the development of an annual SMA integrated audit and assessment schedule (Requirement).
- c. Ensure that the current SMA integrated audit and assessment schedule is accessible to NASA Centers, programs, and projects (Requirement).
- d. Provide an announcement letter to the NASA Center or program SMA Director or project SMA manager identifying the SMA audit and assessment team and their related qualifications (Requirement).
- e. Assign an SMA audit and assessment team lead to plan, execute, and close each SMA audit and assessment in accordance with NPD 1210.2, Chapter 5 (Requirement).
- f. Ensure the development and execution of each SMA audit and assessment plan including the following:
  - (1) Coordination with the NASA Center, program, or project organization to be audited to identify the scope of the SMA audit and assessment, resources required to support audit and assessment, and the agreed to start and finish dates (Requirement).
  - (2) Recruitment of subject matter experts to comprise the SMA audit and assessment team that is independent of the organization being audited (Requirement).

Note: Subject matter experts are recruited from NASA Headquarters and NASA Center organizations with SMA policy/procedures responsibilities or expertise and may also include other Government agency experts.



(3) Development of SMA audit and assessment guides that address the SMA audit and assessment scope and reflect the SMA audit and assessment team's preparation (Requirement).

g. Prior to conducting the SMA audit and assessment, ensure that each SMA audit and assessment team member is trained, through auditor refresher training, and prepared to conduct the SMA audit and assessment (Requirement).

h. Provide the SMA audit and assessment report and corrective action plan (CAP) template information to the appropriate Center Director, Center SMA Director, Program Manager, NASA Headquarters Mission Directorate Associate Administrator, and affected institutional organizations and OSMA personnel with responsibilities for the areas reviewed (Requirement).

i. Ensure that SMA audit and assessment documents, including a listing of best practices identified during audits and assessments, are archived in a manner that is retrievable by designated NASA personnel at each NASA Center, program, and project (Requirement).

j. During the audit, ensure that each noncompliance is traceable to a clearly identified requirement and that each auditor documents the objective evidence of the NASA Center's noncompliance with the requirements appropriate to the audit objective(s) (Requirement).

k. Ensure that CAPs provided by the NASA Centers receive technical comments focused on reducing the probability of recurrence of the finding.

#### 2.2.5 Center Directors shall:

a. Conduct NASA Center SMA self-assessments and provide results to the NSC (Requirement).

b. Incorporate SMA audit and assessment activities into the Center's plans (Requirement).

c. Support the audit or assessment plan by providing the logistic and resource support required for successful execution of and response to the SMA audit and assessment (e.g. planning and schedule coordination, and workspace and information technology support) (Requirement).

d. Identify and provide NASA Center subject matter experts to the SMA audit and assessment team, as requested, during the SMA audit and assessment activities (Requirement).

e. Identify and provide NASA Center subject matter experts to be SMA audit and assessment team members for SMA audits and assessments of other NASA Centers, programs, and projects.

f. Identify a SMA audit and assessment point of contact for the NASA Center to facilitate assistance during the SMA audit and assessment (Requirement).

#### 2.2.6 Center SMA Directors shall:

a. Support and participate in the SMA audit and assessment process activities related to his/her respective organization (Requirement).

b. Incorporate internal Center SMA audit and assessment activities into Center SMA plans (Requirement).

c. Provide to the SMA audit and assessment team lead all necessary review materials including, but not limited to, Center documents; organizational charts; contracts; results of other relevant audits, reviews, or assessments that may have previously verified compliance with requirements; and Center internal SMA audits and assessments to facilitate the planning and execution of the SMA audit and assessment (Requirement).

d. Provide a CAP addressing resolution of all Center SMA audit noncompliances to the NSC

(Requirement).

e. Provide annual status of the CAP to the NSC until all Center SMA audit noncompliances have been closed (Requirement).

2.2.7 Program/project managers shall:

a. Incorporate SMA audit and assessment activities into program/project SMA plans (Requirement).

b. Conduct internal SMA self audits and assessments and make the results available to the NSC (Requirement).

c. Support the SMA audit and assessment plan by providing the program/project logistic and resource support required for successful execution of and response to the SMA audit and assessment (e.g. planning and schedule coordination and workspace and information technology support) (Requirement).

d. Identify a SMA audit and assessment point of contact for the program/project to facilitate assistance during the SMA audit and assessment (Requirement).

e. Provide to the SMA audit and assessment team all necessary review materials including, but not limited to, program/project documents; organizational charts; contracts; results of other relevant audits, reviews, or assessments that may have previously verified compliance with SMA requirements; and program/project internal SMA audits and assessments to facilitate the planning and execution of the SMA audit and assessment (Requirement).

f. Ensure that contracts provide for contractor support of SMA audit and assessment activities.

Note: Contractors who are responsible for implementing SMA requirements will need to provide relevant information and be available to discuss the requirements and implementation during SMA audits and assessments.

g. Provide a CAP, through the Center SMA Director, addressing resolution of all project/program SMA audit noncompliances to the NSC (Requirement). h. Provide CAP status to the NSC annually until all program/project noncompliances have been closed (Requirement).

2.2.8 Other independent assessment organizations (e.g., NASA Engineering and Safety Center (NESC), NASA Independent Verification and Validation (IV&V) Program, and Center-based independent assessment organizations) will identify and provide subject matter experts to the OSMA, as requested, to participate as SMA audit and assessment team members.

## 2.3 IFO Safety Audits

2.3.1 The NSC shall conduct IFO Safety Audits to verify the implementation of applicable Federal, State, and local safety and health statutes and regulations and NASA SMA requirements contained in, but not limited to, the SMA requirements documents (NPDs, NPRs, and NASA standards) posted on the Safety and Mission Assurance Requirements Tree:

<http://www.hq.nasa.gov/office/codeq/doctree/doctree.htm> (Requirement). See Appendix C for a list of documents that are included in IFO Safety Audits.

2.3.2 The NSC shall conduct IFO Safety Audits on a three-year basis at NASA Centers, Component Facilities, and the Institutional part of JPL (an FFRDC) (Requirement).

## 2.4 QAAR

2.4.1 The NSC shall conduct QAARs to verify compliance with NASA SMA quality assurance requirements contained in, but not limited to, the SMA requirements documents (NPDs, NPRs, and NASA standards) posted on the Safety and Mission Assurance Requirements Tree: <http://www.hq.nasa.gov/office/codeq/doctree/doctree.htm> (Requirement). See Appendix C for a list of documents that are included in QAARs.

2.4.2 The NSC conducts QAARs to observe and support program and project SMA audits and assessments of prime contractors and suppliers at their sites, as specified in their contracts. When possible these are coordinated with the Center, program, or project internal audit and assessment schedule.

2.4.3 The NSC shall conduct QAARs on a three-year basis at all NASA Centers (Requirement).

## **2.5 REDAA**

2.5.1 The NSC shall conduct REDAA to verify the flow down of all NASA SMA requirements (Requirement).

2.5.1.1 For NASA Centers, the NSC shall conduct REDAA to review the flow down of all NASA SMA requirements into NASA Centers' documentation (Requirement). The NASA SMA requirements are contained in, but not limited to, the SMA requirements documents (NPDs, NPRs, and NASA standards) posted on the Safety and Mission Assurance Requirements Tree: <http://www.hq.nasa.gov/office/codeq/doctree/doctree.htm>. See Appendix C for a list of documents that are included in REDAA Center requirements flow down reviews.

2.5.1.2 For NASA Centers, the NSC shall conduct REDAA to review and verify proper implementation of the designated Center procurement process to assure proper flow down of all NASA SMA requirements into NASA contracts (as defined in paragraph 2.5.1.1) (Requirement).

2.5.1.3 For NASA designated programs and projects, and as NSC funding permits, the NSC shall conduct REDAA to review flow down of all NASA SMA requirements into NASA program and project documentation (as defined in paragraph 2.5.1.1) (Requirement).

2.5.1.4 The NSC shall baseline the REDAA flow down for all current SMA requirements and then update the baseline as SMA requirements documents are revised (Requirement).

2.5.2 The NSC shall conduct REDAA design engineering reviews to evaluate implementation of NASA SMA requirements contained in, but not limited to, the NASA SMA requirements documents (NPDs, NPRs, and NASA standards) posted on the Safety and Mission Assurance Requirements Tree: <http://www.hq.nasa.gov/office/codeq/doctree/doctree.htm>. See Appendix C for a list of documents that are included in REDAA Design Engineering Reviews.

2.5.3 The NSC shall conduct REDAA design engineering reviews at designated key milestone reviews (e.g. Preliminary Design Review and Critical Design Review) of select programs and projects (Requirement).

# Chapter 3. Safety and Mission Success Review (SMSR)

## 3.1 Overview

3.1.1 The SMSR is a review held to prepare Agency safety and engineering management to participate in program final readiness reviews preceding flights or launches, including experimental/test launch vehicles, or other reviews as determined by the Chief, Safety and Mission Assurance. The SMSR provides the knowledge, visibility, and understanding necessary for senior safety and engineering management to either concur or nonconcur in program decisions to proceed with a launch or significant flight activity.

3.1.2 SMSRs can be NASA Headquarters-led or NASA Center-led.

3.1.3 NASA Headquarters-led SMSRs are conducted for any activity requiring Mission Directorate-level or higher level decision to proceed.

3.1.4 NASA Center-led SMSRs are conducted for any activity requiring lower than a Mission Directorate-level decision to proceed. NASA Center-led SMSRs are led by Center safety management as the delegated SMA TA.

3.1.5 The Chief, Safety and Mission Assurance or the Chief Engineer may request a SMSR (either NASA Headquarters-led or Center-led) for other safety and mission success-critical program or project activities to assure all risks are mitigated to an acceptable level, including:

- a. Test readiness reviews, design certification reviews, indemnification cases, and extravehicular activities.
- b. Reviews of tailoring or nonconformity of program/project SMA or engineering requirements which may affect mission success or facility operations.

3.1.6 The SMSR is designed to:

- a. Review and affirm the results of assurance processes and requirements which have been implemented over the life of the program, including review of the program/project-developed SMA mission assurance process map and mission assurance process matrix.
- b. Verify compliance with the applicable requirements.
- c. Provide adequate knowledge and visibility for senior safety and engineering managers to understand the risks associated with the safety and mission success of program launches, operational stages, or selected critical tests, utilizing input from cognizant program and Center-based safety and reliability review panels (e.g., ground safety, payload safety, range safety, facility safety).
- d. Examine mission preparation status, open work issues, and concerns.
- e. Assess overall systems readiness.
- f. Provide an SMA and engineering position on whether to concur or nonconcur in proceeding with the event/operation being reviewed.

3.1.7 Data presented at the NASA Headquarters-led SMSR is developed by the program, cognizant NASA Headquarters and NASA Center SMA and engineering organization(s), the NSC, other

independent assessment groups (e.g., NESC, NASA IV&V Program, Center-based independent assessment organizations), applicable safety review panels, and any individuals or organizations representing minority or dissenting opinions.

3.1.8 SMSR records shall be prepared and retained onsite; then destroyed six years after mission completion by the office that conducted the SMSR (Headquarters or delegated Center SMA TA).

## **3.2 Roles and Responsibilities**

3.2.1 The Chief, Safety and Mission Assurance shall:

- a. Co-chair each NASA Headquarters-led SMSR (Requirement).
- b. Conduct a poll of selected SMSR participants at the conclusion of the NASA Headquarters-led SMSR for a recommendation to proceed (Requirement).
- c. Decide whether to recommend proceeding or not proceeding to the next level of review (ex: Flight Readiness Review (FRR), Mission Readiness Briefing (MRB), or other, depending on which Mission Directorate is involved) (Requirement).
- d. Communicate any concerns arising from the review with the Associate Administrator for the Mission Directorate involved (Requirement).
- e. Designate an OSMA SMSR Manager (Requirement).

3.2.2 The Chief Engineer shall:

- a. Co-chair each NASA Headquarters-led SMSR (Requirement).
- b. Decide whether to recommend proceeding or not proceeding to the next level of review (ex: FRR, MRB, or other, depending on which Mission Directorate is involved) (Requirement).
- c. Communicate any concerns arising from the review with the Associate Administrator for the Mission Directorate involved (Requirement).

3.2.3 Center Directors shall provide the logistic and resource support required for successful execution of NASA Headquarters-led and NASA Center-led SMSR activities (Requirement).

3.2.4 Center SMA Directors and Center Engineering Directors shall:

- a. Participate in the NASA Headquarters-led SMSR process for each program/project applicable to their Center (Requirement).
- b. Direct the implementation of a Center-led SMSR process for reviews chaired below the Mission Directorate level in which the Center SMA Organization is asked to concur/nonconcur (Requirement).
- c. Coordinate with program/project management and Center procurement organizations to ensure that contracts provide for contractor support of NASA Headquarters-led and Center-led SMSR activities (Requirement).
- d. Complete SMSR actions within the assigned timeframe (Requirement).

3.2.5 The delegated SMA TA shall:

- a. Chair each Center-led SMSR (Requirement).



- b. Conduct a poll of selected SMSR participants at the conclusion of the Center-led SMSR for a recommendation to proceed (Requirement).
- c. Ensure that the basic elements of a Center-led SMSR, at a minimum, address the NASA Headquarters-led SMSR elements and, to the extent possible, parallel NASA Headquarters-led SMSR residual risk reporting formats (Requirement).
- d. Complete SMSR actions within the assigned timeframe (Requirement).

#### 3.2.6 Program/project managers shall:

- a. Provide the support needed to prepare and present material to NASA Headquarters-led and Center-led SMSRs (Requirement).

Note: SMSR presentations are tailored for each specific mission and content is negotiated in advance of the SMSR.

- b. Ensure that program/project material presented at a SMSR, including the mission assurance process map and mission assurance process matrix, is accurate and meets the specified needs of the SMSR (Requirement).
- c. Coordinate with Center SMA and Center procurement organizations to ensure that contracts provide for contractor support of NASA Headquarters-led and Center-led SMSR activities (Requirement).

Note: This includes contractor support that may be needed to prepare SMSR presentations or present information at the SMSR.

- d. Complete SMSR actions within the assigned timeframe (Requirement).

#### 3.2.7 SMA managers (including Chief Safety and Mission Assurance Officers (CSOs)) and engineering managers reporting (matrix or direct) to the program/project manager shall:

- a. Help to identify all independent organizations which have assessed portions of the program or project (Requirement).
- b. Provide material input for inclusion in SMSRs (Requirement).
- c. Compile the program/project SMSR material, including the program's assessment of residual safety and mission success risk related to the upcoming milestone, identifying risk consequence and likelihood with supporting rationale and uncertainty associated with estimated likelihood (Requirement).
- d. Coordinate the presentation of the Center and program/project SMSR material with the Chief, Safety and Mission Assurance (Requirement).
- e. Coordinate within the program/project and support NASA Headquarters-led and Center-led SMSR preparation meetings, as required (Requirement).
- f. Participate in SMSR polling as described in paragraphs 3.2.1.b and 3.2.5.b (Requirement).
- g. Complete SMSR action items within the assigned timeframe (Requirement).

#### 3.2.8 Other independent assessment organizations (e.g., NESC, NASA IV&V Program, Center-based independent assessment organizations) shall:

- a. Identify program/project assessments conducted by their respective organizations, summarize, and provide them to the OSMA SMSR Manager to ensure that the Chief, Safety and Mission Assurance

has all relevant data at the SMSR and to avoid duplication of effort on the part of other independent assessment organizations (Requirement).

b. Identify any issues or SMA residual risks related to their respective assessments (Requirement).

c. Identify any areas where the findings of the independent assessments differ from the program/project assessment (Requirement).

d. Participate, as applicable, in SMSR polling described in paragraph 3.2.1.b and 3.2.5.b (Requirement).

e. Complete SMSR action items within the assigned timeframe (Requirement).

### 3.2.9 The OSMA SMSR Manager shall:

a. Coordinate with the OSMA Mission Support Division, the Safety and Assurance Requirements Division, and Center-based SMA managers to identify which pending program and project events warrant a SMSR (Requirement).

b. Coordinate with the Office of the Chief Engineer, OSMA, Center-based SMA managers, and independent assessment organizations (e.g., NESC, NASA IV&V Program, Center-based independent assessment organizations) to identify participants for a NASA Headquarters-led SMSR (Requirement).

c. Coordinate with the Office of the Chief Engineer, OSMA, Center-based SMA managers, and independent assessment organizations (e.g., NESC, NASA IV&V Program, Center-based independent assessment organizations) to establish an appropriate integrated schedule for NASA Headquarters-led and Center-led SMSRs and agenda for upcoming NASA Headquarters-led SMSRs (Requirement).

d. Coordinate with the program/project SMA and engineering managers to establish the team members for the SMSR polling group in coordination with the Chief, Safety and Mission Assurance and the Chief Engineer (Requirement).

e. Maintain and update, based on operational experience, detailed SMSR process documentation and work instructions (Requirement).

# Appendix A. Definitions

**A.1 Audit.** A formal review to assess compliance with SMA policies, procedures, processes, requirements, specifications, baselines, standards, instructions, codes, and contractual and licensing requirements, including Federal, State, and local safety and health statutes and regulations.

**A.2 Audit and Assessment Point of Contact.** A person of the organization being audited that ensures that the audited organization is prepared for the audit, coordinates the audit schedule with the audit and assessment team, ensures that the appropriate personnel from the audited organization are available during the audit and can support the audit schedule, ensures that the audit and assessment team has resources onsite to enable the completion of the audit (such as working space and information technology support).

**A.3 Audit and Assessment Report.** A document that provides a record of an audit, review, or assessment results.

**A.4 Audit and Assessment Team.** A team comprising subject matter experts from NASA Headquarters, NASA Centers, and, if necessary, non-NASA organizations selected to conduct the SMA audits and assessments.

**A.5 Audit and Assessment Team Lead.** The NASA civil servant responsible for the required audit preparation, audit, and post-audit actions for NSC-led or Center internal SMA audits, reviews, and assessments.

**A.6 Center SMA Director.** As used in this directive, this term includes all Center management personnel designated by the Center Director to implement SMA audits and assessments requirements.

**A.7 Audit Finding.** A conclusion of importance based on facts and objective evidence established during SMA audits, reviews, and assessments.

**A.8 Institutional/Facility/Operational Safety Audit.** An independent audit/review of NASA Center compliance with institutional, facility, and operational SMA requirements. This includes applicable Federal, State, and local safety and health statutes and regulations and NASA SMA requirements.

**A.9 Mission Assurance Process Map.** The mission assurance process map is a high-level, graphical representation of governing SMA policy and requirements, processes, and key participant roles, responsibilities, and interactions. It also includes the reporting structure that constitutes a program's/project's SMA functional flow.

**A.10 Mission Assurance Process Matrix.** The mission assurance process matrix is constructed to identify program life cycle assurance agents and specific assurance activities, processes, responsibilities, accountability, depth of penetration, and independence. The matrix includes key assurance personnel in Engineering, Manufacturing, Program Management, Operations, and SMA.

**A.11 Objective Evidence.** Data verifying or supporting the existence or variety of a finding. Objective evidence may be obtained through observation, measurement, test, or other means and is not influenced by prejudice, emotion, or bias. Examples of objective evidence include, but are not limited to, procedures, records, work instructions, databases, reports, organizational charts, interviews, hardware, facilities test reports, configuration control documentation (i.e., drawings and specifications), mishap reports, corrective actions, and lessons learned.



**A.12 Quality Audit, Assessment, and Review.** An independent verification that each NASA Center, program, and project is in compliance with the applicable NASA SMA quality assurance requirements.

**A.13 Requirement Flow Down and SMA Engineering Design Audits and Assessments.** 1) An independent verification of the flow down of SMA requirements to the NASA Centers, programs, and projects and 2) An independent evaluation of the NASA SMA requirements implemented on programs and projects not included in the IFO Safety Audit and QAAR processes.

# Appendix B. Acronyms

CAP	Corrective Action Plan
C.F.R	Code of Federal Regulations
CSO	Chief Safety Officer
FRR	Flight Readiness Review
IFO	Institutional/Facility/Operational
IV&V	Independent Verification and Validation
JPL	Jet Propulsion Laboratory (a Federally Funded Research and Development Center)
MRB	Mission Readiness Briefing
NASA	National Aeronautics and Space Administration
NASA-STD	NASA Standard
NESC	NASA Engineering and Safety Center
NPD	NASA Policy Directive
NPR	NASA Procedural Requirements
NSC	NASA Safety Center
OSMA	Office of Safety and Mission Assurance
PVS	Pressure Vessels and Pressurized Systems
PRA	Probabilistic Risk Assessment
QAAR	Quality Audit, Assessment, and Review
R&M	Reliability and Maintainability
REDAA	Requirement Flow Down and SMA Engineering Design Audits and Assessments
SMA	Safety and Mission Assurance
SMSR	Safety and Mission Success Review
TA	Technical Authority

# Appendix C. Table of SMA Requirements Documents and Associated Audits, Reviews, and Assessments

<b>Requirements Document</b>	<b>IFO Safety Audit</b>	<b>QAAR</b>	<b>REDAA-Center Requirement Flow Down</b>	<b>REDAA - Design Engineering Reviews</b>
NPD 8700.1, NASA Policy for Safety and Mission Success	X	X	X	X
NPD 8700.3, Safety and Mission Assurance (SMA) Policy for NASA Spacecraft, Instruments, and Launch Services			X	X
NPD 8710.5, Policy for Pressure Vessels and Pressurized Systems	X		X	
NPD 8720.1, NASA Reliability and Maintainability (R&M) Program Policy			X	X
NPD 8730.1, Metrology and Calibration		X	X	
NPD 8730.2, NASA Parts Policy		X	X	
NPD 8730.5, NASA Quality Assurance Program Policy		X	X	
NPR 7900.3, Aircraft Operations Management	X (Currently audited by the Intercenter Aircraft Operations Panel)		X	
NPR 8000.4, Agency Risk Management Procedural Requirements			X	X
NPR 8621.1, NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping	X (Including the Center and resident programs and projects)		X	

NPR 8705.2, Human-Rating Requirements for Space Systems			X	X
NPR 8705.4, Risk Classifications for NASA Payloads			X	X
NPR 8705.5, Technical Probabilistic Risk Assessment (PRA) Procedures for Safety and Mission Success for NASA Programs and Projects			X	X
NPR 8705.6, Safety and Mission Assurance Audits, Reviews, and Assessments	X	X	X	X
NPR 8715.1, NASA Occupational Safety and Health Programs	X		X	
NPR 8715.3, NASA General Safety Program Requirements	X (Chapters related to Center Safety Programs)		X	X (Including those chapters related to system safety)
NPR 8715.5, Range Flight Safety Program	X (Non-Unmanned Aircraft Systems range operations, including space launch/ entry and scientific balloon operations)		X	
NPR 8715.6, NASA Procedural Requirements for Limiting Orbital Debris			X	X
NPR 8715.7, Expendable Launch Vehicle Payload Safety Program			X	X
NPR 8735.1, Procedures for Exchanging Parts, Materials, and Safety Problem Data Utilizing the Government-Industry Data Exchange Program and NASA Advisories.		X (Including Center operations and programs and projects)	X	

NPR 8735.2, Management of Government Quality Assurance Functions for NASA Contracts		X	X	
NASA-STD-8709.20, Management of Safety and Mission Assurance Technical Authority (SMA TA) Requirements (As required by NPR 8715.3)			X	X
NASA-STD-8719.7, Facility System Safety Guidebook (As required by NPR 8715.3)	X		X	
NASA STD-8719.9, Standard for Lifting Devices and Equipment (As required by NPR 8715.3)	X		X	
NASA-STD-8719.10, Standard for Underwater Facility and Non-Open Water Operations (As required by NPR 8715.3)	X		X	
NASA-STD-8719.11, Safety Standard for Fire Protection (As required by NPR 8715.3)	X		X	
NASA-STD-8719.12, Safety Standard for Explosives, Propellants, and Pyrotechnics (As required by NPR 8715.3)	X		X	
NASA-STD-8719.13, Software Safety Standard (As required by NPR 7150.2)		X	X	
NASA-STD 8719.14, Process for Limiting Orbital Debris (As required by NPR 8715.6)			X	X
NASA-STD-8719.17, NASA Requirements for Ground-Based Pressure Vessels and Pressurized Systems (PVS) (As required by NPD 8710.5)	X		X	

NASA-STD-8739.1, Workmanship Standard for Polymeric Application on Electronic Assemblies (as required by NPD 8730.5)		X	X	
NASA-STD-8739.2, Workmanship Standard for Surface Mount Technology (as required by NPD 8730.5).		X	X	
NASA-STD-8739.3, Soldered Electrical Connections (as required by NPD 8730.5)		X	X	
NASA-STD-8739.4, Crimping, Interconnecting Cables, Harnesses, and Wiring (as required by NPD 8730.5)		X	X	
NASA-STD-8739.5, Fiber Optics Terminations, Cable Assemblies, and Installation (as required by NPD 8730.5)		X	X	
NASA-STD-8739.8, Software Assurance Standard (as required by NPR 7150.2)		X	X	